Answer on Question #53907-Physics-Classical Mechanics

An object that has mass m=2 kg is placed on a plane having an inclination to the horizontal of α = 30O. The coefficient of friction between the object and the surface is 0.3. Find the horizontal force necessary to act on the object that would cause the object to move up the slope with a constant speed.

Solution

Force that is making the mass to tend to slide along the slope

$$mg \sin \alpha = 2 \cdot 9.8 \cdot \sin 30 = 9.8 \ N.$$

Friction force

$$F_{fr} = \mu \, mg \cos \alpha = 0.3 \cdot 2 \cdot 9.8 \cdot \cos 30 = 5.1 \ N.$$

Force parallel to plane to overcome resisting force

$$T = mg \sin \alpha + \mu \, mg \cos \alpha = 9.8 + 5.1 = 14.9N.$$

The horizontal force necessary to act on the object that would cause the object to move up the slope with a constant speed

$$F = \frac{T}{\cos \alpha} = \frac{14.9}{\cos 30} = 17.2 \ N.$$

Answer: $17.2 \ N$.